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#### Cover

*U.S.S. New Mexico (BB 40), an oil painting by Walter L. Greene. Launched on 13 April 1917, the battleship New Mexico was commissioned on 20 May 1918, in time to escort President Woodrow Wilson home from the Versailles Peace Conference. Designated flagship of the newly organized U.S. Pacific Fleet in 1919, New Mexico was to receive six battle stars for World War II service; the ship is pictured as appearing in 1925. Walter L. Greene (1870–1956) was an architect, artist, and prolific illustrator, known for his masterful use of color and detail in portraying technological subjects, notably locomotives and warships. The painting, which belongs to the U.S. Navy Art Collection in Washington, D.C. (by whose courtesy it appears), hung in an exhibit—“Command of the Sea: Highlights from the U.S. Naval Academy Museum, U.S. Navy Art Collection, and the U.S. Naval War College Museum”—at the Newport Art Museum in Newport, Rhode Island, in July–August 2007.*



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# MINES AND UNDERWATER IEDS IN U.S. PORTS AND WATERWAYS

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## Context, Threats, Challenges, and Solutions

Scott C. Truver

A broad spectrum of nontraditional and asymmetric threats challenges U.S. maritime homeland security.<sup>1</sup> The smuggling of drugs, arms, and people; vesselborne improvised explosive devices, like that used by terrorists against the guided-missile destroyer USS *Cole* in October 2002; proliferation of chemical, biological, radiological, nuclear, and high-explosive weapons of mass destruction and disruption; piracy and organized crime; overexploitation of marine resources and the destruction of marine habitats; environmental attacks and trade disruption; political and religious extremism; mass migration flows; global health threats (e.g., the spread of infectious diseases like SARS and avian flu)—all these and more pose far-reaching dangers for American security interests at home and abroad. Under the cloak of legal activity, groups that would do us harm can enter the U.S. homeland anywhere along more than ninety-five thousand miles of coastlines and through some 360 ports from Maine to Guam.

“The challenge is enduring,” Admiral Thad W. Allen, Commandant, U.S. Coast Guard, wrote in his foreword to the Coast Guard’s 2007 maritime security strategy.<sup>2</sup> “The threats of the Cold War are gone, and we again find ourselves op-

erating in an environment where piracy, illegal migration, drug smuggling, terrorism, arms proliferation and environmental crimes are carried out by anonymous, loosely affiliated perpetrators.”

Naval mines and underwater improvised explosive devices (UWIEDs, or minelike “booby traps”) are among these threats to U.S. maritime interests.<sup>3</sup> A true “sleepers threat,” mines and UWIEDs can with great effect attack the good order of American ports and

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waterways. They are the quintessential asymmetric naval weapons, used for more than two centuries by weak naval powers against the strong, regardless of whether they were “unworthy of a chivalrous nation,” as Rear Admiral David G. Farragut, of “Damn the torpedoes!” fame, declared.<sup>4</sup> If left unaddressed, they could constitute an Achilles’ heel for U.S. homeland security.

Until very recently, naval mines and UWIEDs, if included in domestic maritime threat assessments at all, have usually been relegated to the status of a “lesser included” problem.<sup>5</sup> If we can deal, it is argued, with what planners believe are the more likely maritime threats, especially vesselborne devices, we can certainly handle mines and *underwater* IEDs. But the history of naval and terrorist mining since 1945 challenges this assumption, and the stakes are high if it turns out to be wrong. Indeed, the assessments and planning that *have* focused on the M/UWIED threat underscore critical weaknesses in how federal, regional, state, and local actors charged with ensuring America’s maritime security, as well as private entities whose assets are at risk, must respond to weapons that can easily be deployed in U.S. ports and waterways.

#### THE NATURE OF THE M/UWIED THREAT

In the American experience, the first use of UWIEDs came in September 1776, when the patriot (or, in English eyes, terrorist) David Bushnell attempted to fix a limpet mine on Lord Howe’s flagship HMS *Eagle* in the Hudson River.<sup>6</sup> Bushnell’s attack was frustrated by bad luck and the “passive protection” of the ship’s iron fittings. Fifteen months later, Bushnell used floating kegs of gunpowder fitted with contact-firing mechanisms against the British fleet above Philadelphia; four British sailors died trying to retrieve the kegs from the Delaware River—an early example of explosive ordnance disposal (EOD) against an unknown threat—but the fleet was unscathed.<sup>7</sup>

More than two centuries on, terrorists can use or threaten to use mines and UWIEDs for a variety of political, economic, or military ends, often with psychological effects foremost in mind. While small devices might have no more than nuisance value, as a way to exacerbate anxieties (Boston’s reaction to “guerrilla marketing” in early 2007 comes to mind), larger mines can be placed surreptitiously in channels and harbors to achieve spectacular effects—against, for example, the Staten Island Ferry, crammed with 2,500 commuters during an evening rush hour, or a cruise ship with four thousand vacationers and crew on board leaving Miami or Seattle.<sup>8</sup> The tragedy of hundreds of bodies floating in a port would intensify the psychological message about the true security of America’s home waters.

Mines can directly attack the nation’s waterborne trade. More than 90 percent of American exports and imports by volume transits U.S. ports, and the efficient

and safe movement of our foreign, coastal, and inland-waters trades is critical for America's globalized, just-in-time, and just-enough economy. The economic consequences of just a few mines in our ports could be catastrophic, as the two-week West Coast labor slowdown in the fall of 2002 implies—a \$1.95 billion impact per day. According to a University of California at Berkeley analysis, the direct and indirect economic impacts of a twenty-day longshoremen's work action would cost the U.S. economy more than \$50 billion (in 2002 dollars).<sup>9</sup> Even if no ships were sunk or damaged and no channels were blocked, explosions in a few key ports on East, Gulf, and West coasts and in the Saint Lawrence Seaway—clearly not an impossible feat, as September 11th tragically proved—would have a chilling effect on commercial shipping in terms of increased insurance costs and vessel lay days. The economic tremors would reverberate throughout the nation and to trading partners overseas.

There could be serious military impacts, as well. Mines in critical waterways could slow the movement of military cargoes in crisis and conflict. During World War II, the port of Charleston, South Carolina, was closed for sixteen days by mines from German submarines. In all, U-boats managed to lay 327 mines from Halifax, Nova Scotia, to the Mississippi Delta, closing several ports for a total of forty days and sinking or damaging eleven ships. Today, while mines might not be “showstoppers,” they would certainly be “speed bumps”; just a few weapons in the approaches to the port of Savannah, Georgia; the Houston Ship Channel; and one or two other waterways could hamper the military sealift that undergirds war plans.<sup>10</sup>

Mines and underwater IEDs are easy to acquire or build, and they are cheap, ranging from a few tens of dollars to thirty thousand dollars for the most advanced, multiple-influence weapons.<sup>11</sup> But their low cost belies their potential for harm. They can be deployed by submarines, surface warships, small craft, commercial vessels, dhows, fishing vessels, pleasure boats, fixed-wing aircraft, and helicopters. They are designed for operations from the surf zone (less than ten-foot water depth) to deep water (greater than two hundred feet). Their payloads can range from a few pounds to several tons of high explosive, and they can have a variety of firing mechanisms: remote control and command; contact; and magnetic, acoustic, seismic, pressure, or combinations of some or all such “influence” signatures of ships.

Mines can be buoyant and suspended in the water column, close tethered to the bottom, resting on the bottom, or even buried under sediments to confound minehunting and sweeping. Some mines are mobile, capable of being launched from submarines thousands of yards from intended minefields, while others have torpedo or rocket-propelled warheads that dramatically expand potential damage zones against submarine and surface targets. Limpet mines are designed



to be placed directly on targets by combat swimmers or, perhaps even today, unmanned undersea vehicles (UUVs). Old mines can be refitted with modern, highly sophisticated components, and any mine can be equipped with counter-countermeasure features to frustrate EOD, sweeping, and hunting. They can be fabricated from fiberglass and plastic, making them extremely difficult to detect, identify, or counter—once in the water.

More than that, mines are a broad-spectrum, global threat. According to Navy data, more than a quarter-million naval mines of more than three hundred types are in the inventories of more than fifty navies, not counting American weapons. More than thirty countries produce, and more than twenty countries export, mines. Even highly sophisticated weapons are available on the black market, usually on a cash-and-carry basis. Worse, these Navy figures are for mines proper; they do not include UWIEDs, which can be fabricated easily and cheaply, as an Iraqi “bicycle”-type, floating, anti-small-boat mine encountered during Operation DESERT SHIELD proved. As then-Chief of Naval Operations (CNO) Admiral C. A. H. Trost, USN, remarked in July 1989, at the height of the Persian Gulf “Tanker War” mine strikes:

Very little sophistication is required to manufacture and deploy mines. Any nation with either money to buy mines on the open market, or the capability to forge metal and make explosives, can become an active participant in mine warfare. Minefields can be seeded by anything that flies or floats. And again, crude but effective mines are cheap, easy to stockpile, and easily concealed in holds of ships and fishing boats.<sup>12</sup>

## THE POST-WORLD WAR II MINE EXPERIENCE

Winston Churchill once remarked, “The farther backward you look the farther forward you can see.” The U.S. Navy’s post-World War II mines and mine countermeasures experience underscores the cost-effectiveness of these weapons that wait and the need to counter them.<sup>13</sup>

At the outset of the Korean War, in September–October 1950, some three thousand Soviet and Chinese mines kept a 250-ship amphibious task force at bay off the coast of Wonsan for a week. Three minesweepers were lost and more than a hundred men killed during the initial minesweeping operations through early November. Overall, though the U.S. mine force accounted for just 2 percent of the UN naval forces during the three-year “police action,” it suffered 20 percent of the casualties.

Two U.S. Navy warships suffered mine strikes during the Vietnam War, while the Vietcong and North Vietnamese army used a bewildering variety of UWIEDs and mines—from antipersonnel floating-basket booby traps with a handful of explosive to a two-thousand-pound command-detonated weapon—in the rivers and deltas. (Another one or two Navy ships might have been victims

of “friendly fire” from USN converted-bomb Mark-62/63/64 Destructor mines—themselves essentially very sophisticated UWIEDs.) As the Navy continues to stand up its new Naval Expeditionary Combat Command and squadrons, the experiences of task forces 116 and 117 in Vietnam can provide important lessons for future “riverine” and “brown water” MCM operations.<sup>14</sup>

During the Tanker War, the guided-missile frigate USS *Samuel B. Roberts* almost sank, with potentially great loss of life, after striking a Soviet-designed World War I-era contact mine on 14 April 1987.<sup>15</sup> Only heroic efforts kept the ship afloat. Repairs cost about \$96 million, from a \$1,500 weapon. On 18 February 1991, in the same waters, the helicopter assault ship USS *Tripoli* encountered an Iraqi contact mine, which blew a hole twenty-three feet by twenty-five in its starboard side. Four hours later, the Aegis guided-missile cruiser *Princeton* was almost broken in half by an Italian-made Manta bottom mine in approximately sixty-five feet of water. *Princeton* had to be taken out of the war, and the total cost to repair came to more than \$110 million—all from a single mine costing about fifteen thousand dollars. The presence of some 1,300 Iraqi mines laid by barges and tugs in the northern Persian Gulf utterly frustrated plans for a Marine amphibious task force to open up a second front east of Kuwait City. Finally, the posthostilities mine clearance took eight navies’ mine countermeasures (MCM) forces nearly two years to confirm that ten mine-danger areas had been made safe for naval and maritime traffic. The U.S. Navy still homeports several MCM vessels in Bahrain, just in case a quick response is needed.

Since the end of World War II, then, mines have damaged or sunk four times more U.S. Navy ships than have all other means of attack: mines, fifteen ships; missiles, one; torpedoes/aircraft, two; small-boat terrorist attack, one (and this last, the attack on *Cole*, can be seen as a “terrorist in the loop” mobile-mine strike).

In addition to the U.S. Navy’s experiences with mines since September 1945, mines have been used or threatened in a wide variety of scenarios that are harbingers of terrorist dangers yet to come. In October 1946, during a “freedom of navigation” operation, two Royal Navy warships were severely damaged by Soviet-made mines laid by Albania in the Corfu Channel. In 1974–75, the U.S. Navy assisted in clearing the Suez Canal and its approaches of mines and unexploded ordnance left from the October 1973 Arab-Israeli War.

The “patriotic scuba diver” mine crisis of January 1980 showed that a terrorist threat of mines—in this case “mining” the Sacramento River during the Soviet grain embargo announced by President Jimmy Carter—could have dramatic effects on maritime trade. An unknown person identifying himself as the “patriotic scuba diver” claimed by telephone to have placed a mine in the waterway; all shipping movement ceased almost immediately. Once on scene, the

Navy minesweeper USS *Gallant* required four days of intensive minehunting to determine the channel was safe. No mines were discovered, but the cost in merchant vessel lay days caused by the hoax was estimated in the hundreds of thousands of dollars.

Since the 1970s, the Tamil Tigers have been particularly vicious in mine attacks against Sri Lankan government ships, commercial vessels, and private boats. In 1982, the Argentine military used mines during the Falklands War. Reports have the Nicaraguan Contras using limpet mines to damage two ships in Corinto Harbor in 1984, in a direct challenge to the Sandinistas.

But it was the “Mines of August” crisis in the summer of 1984 that showed most vividly how easily mines can be used as weapons of maritime terror.<sup>16</sup> From 19 July to 13 September as many as twenty-three vessels reported damage from underwater explosions in the Red Sea and Gulf of Suez, a rash of attacks that generated a massive multinational mine countermeasures response. Egypt, France, Great Britain, Italy, the Netherlands, the Soviet Union, and the United States helped clear the waterway. Only one new mine was recovered and rendered safe, by Royal Navy divers—a 1,700-pound, multiple-influence Soviet bottom mine completely unknown in the West. (The British and French MCM forces also detected, identified, and destroyed a two-thousand-pound bomb, a practice torpedo, and numerous old mines, some dating to World War II.) Later it was proved that Libyan naval personnel aboard the commercial ferry *Ghat* had rolled off the mines as the vessel meandered throughout the waterway, completely unchallenged, for more than two weeks. This experience prompted Admiral Trost to comment that

five years ago mine warfare entered the age of indiscriminate terrorism and international blackmail. . . . No country claimed responsibility for this act, but that did not change the reality that mines were there impeding the flow of commerce in this major waterway. . . . The bottom line is simple. Mine warfare may not be considered glamorous, some even call it ugly. But it works well. For the most part, a mine doesn’t care who or what you are, and usually gives little warning of its presence.<sup>17</sup>

Finally (although more incidents might well remain unreported), on 21 April 2004 a tugboat operator on Lake Pontchartrain, Louisiana, spotted a suspicious floating bag and called the Coast Guard.<sup>18</sup> The Coast Guard contacted the Jefferson Parish bomb squad, which fished the bag out of the water. It proved to be a UWIED, a couple of pounds of explosive in plastic pipes with a timer, wrapped in trash bags to keep it afloat. One possible target was Senator John Kerry, a presidential hopeful who had been scheduled for a campaign trip on the lake. The bomb squad used a water cannon to neutralize the device.

In addition to showing how easily a UWIED can be built, this incident highlights the challenges of deciding who is in charge of response to a mine crisis in American ports and waterways: the Coast Guard or the Navy? What are the roles and responsibilities of local police bomb squads or fire departments? In some jurisdictions, even natural-resources police could be involved. Most fundamentally, is an M/UWIED incident a homeland security or a homeland-defense “problem,” and who makes the call, one way or the other, when the first weapon fires?

### FRAMEWORK AND RESPONSIBILITIES

At the federal level, domestic mine/UWIED responsibilities seem to be clear. Under the 2002 Maritime Transportation Security Act, the Coast Guard, in the Department of Homeland Security (DHS), is the lead federal agency for maritime homeland security (MHLS).<sup>19</sup> The Federal Bureau of Investigation, in the Department of Justice, is the lead agency for terrorism/counterterrorism; Justice’s Bureau of Alcohol, Tobacco, Firearms and Explosives also figures prominently in investigations involving explosives. The Navy, in the Department of Defense, is the lead for mine countermeasures expertise and operations. Below this strategic context, however, relationships remain murky, and the frameworks—let alone the formal requirements—for responding to a mine or UWIED threat at the operational and tactical levels need work.

Under the 2005 *National Strategy for Maritime Security*, the National Response Plan, the National Incident Management System and the National Incident Command System, and the Maritime Operational Threat Response (MOTR) Plan provide the going-in architecture for MHLS operations. But regional, state, local, and commercial partners must also be closely integrated and informed. Indeed, a multiagency, multiple-governmental command, control, communications, intelligence, reconnaissance, and surveillance architecture and response system is needed for each U.S. port—or at least the seventeen “tier one” facilities having significant military or economic importance—within the overall maritime homeland security and maritime domain awareness (MDA) framework. Mines and UWIEDs collectively represent just one set of the many threats to the nation’s maritime homeland security, but they are particularly treacherous, insidious, and deadly—and at this writing in mid-2007 were not yet included in the Defense Department’s MDA concept of operations. Nevertheless, the Joint Chiefs of Staff *Homeland Defense* publication in numerous places does address the threat from mines in U.S. ports and waterways and outlines the supported and supporting roles in domestic countermining and mine countermeasures operations.<sup>20</sup>

The U.S. Coast Guard’s sector commanders, in their roles as “Captains of the Port” (COTPs) and local Federal Maritime Security Coordinators, will be

crucial to mine/UWIED defense. Among other vital security and safety functions, COTPs:

- Establish the port maritime security plans for their respective areas of responsibility
- Conduct risk-based area security assessments
- Develop area maritime transportation plans
- Have command-control-communications responsibilities and authorities for MHLS incidents
- Can close ports in the event of emergency
- Provide a vital “bridging function” among the Defense and Navy departments and regional, state, local, and commercial partners, as a result of the Coast Guard’s inherent military, civilian, maritime, law enforcement, and humanitarian character and authorities.

But a Captain of the Port has no capability—or even desire—actually to conduct MCM operations. Vice Admiral James D. Hull, USCG (Retired), who served as Atlantic Area Commander, understood well the need to deal with mines and UWIEDs in American waters, “but that’s primarily the Navy’s responsibility,” as he later explained.<sup>21</sup> “The Navy has the expertise and equipment to do the job. The real question is whether the Navy’s MCM forces can respond in the appropriate time to neutralize a no-notice threat.” Of interest in this regard is the fact that the Coast Guard’s 2007 *Strategy for Maritime Safety, Security, and Stewardship* in only two places mentions “water-borne IEDs,” and even there it limits the concept to a small-boat/bomb threat like the one that attacked the USS *Cole* and nowhere mentions mines or underwater IEDs.<sup>22</sup> Likewise, the Coast Guard’s Underwater Terrorism Protection Plan of mid-2007 does not address mine/UWIED threats or defense requirements.

Since 2003, the Navy and Coast Guard have, however, come together at the “grassroots” levels to address the mine and UWIED threat. The three LEAD SHIELD exercises on the West Coast have uncovered surprising capabilities and strengths but also many more areas that need close attention, especially command-and-control relationships involving nonmilitary participants.<sup>23</sup> Other war games conducted by the Office of Naval Research and by the mine warfare program at the U.S. Naval Postgraduate School during 2006–2007 have identified technological, system, and platform issues that also need focused attention and sustained funding.<sup>24</sup>

More, a 2005 memorandum of agreement between the Department of Defense and the Department of Homeland Security for the inclusion of the Coast

Guard in support of Maritime Homeland Defense (MHLD) established for MHLD operations a Defense Department joint command and control structure that includes Coast Guard forces and identified that service's MHLD roles, missions, and functions.<sup>25</sup> It recognizes that the Coast Guard "is at all times a military service and a branch of the armed forces of the United States," is charged with maintaining a state of readiness "to function as a specialized service in the Navy in time of war," and is "authorized to work closely and cooperatively with the Navy during peacetime." The memorandum of agreement also underscores the Coast Guard's role "in support of the *National Security Strategy* while maintaining its identity as an armed force." Recognizing also that maritime homeland defense missions "required flexibility, time-critical response, and immediate access to a broad spectrum of capabilities and associated forces to ensure mission success," it "establishes a standing DoD [Department of Defense]/DHS working relationship and operational C2 [command and control] construct for conducting MHLD missions under the authority and command of DoD."

The next year, the secretaries of Defense and Homeland Security signed a memorandum of agreement for Defense support to the Coast Guard for maritime homeland security.<sup>26</sup> That memorandum identified and documented appropriate MHLS capabilities, roles, missions, and functions for the Defense Department and arrangements to facilitate the rapid transfer of tactical control of forces to the Coast Guard in support of MHLS operations generally. The memorandum recognized the constraints on Defense Department support to law enforcement operations, a consequence of the 1878 *Posse Comitatus* Act, which does not affect the Coast Guard.<sup>27</sup> It also laid down that the Coast Guard would have the predominant MHLS role and be the lead federal agency for exercising law enforcement authorities on waters subject to American jurisdiction (from inland waters to the extent of the exclusive economic zone) and on, under, and over the high seas.<sup>28</sup> In addition, the memorandum of agreement underscored the Coast Guard's role in the armed deterrence of as well as response to acts of terrorism in the maritime environment. Although it granted the Coast Guard tactical control over Defense Department forces in maritime homeland defense operations, it noted that this would not confer "type command" authority;<sup>29</sup> all DoD forces operating under Coast Guard tactical control would remain under DoD command.

The Maritime Operational Threat Response Plan and its outline of supported/supporting relationships are particularly important for defending against mines and UWIEDs. The plan includes mines in its catalog of threats to U.S. maritime security and identifying Defense as "the lead MOTR agency for tactical response and resolution of nation-state threats within the maritime domain," as well as for "maritime terrorist threats that occur in the forward maritime areas of



responsibility.” Further, while the Coast Guard has the lead in responding to maritime terrorist threats in U.S. waters, clearly the Defense Department has a major role as a supporting agency.

For domestic MCM operations, then, the Navy’s airborne, surface, and underwater MCM forces and EOD mine countermeasures assets, particularly the shallow-water Naval Special Clearance Team (NSCT) 1, with its marine mammals and UUV MCM systems, will be “chopped” (operationally turned over) to USCG sector commanders/Captains of the Port, as they have overall command and control responsibilities for maritime homeland security.

These dedicated MCM forces are being concentrated in Norfolk, Virginia, and San Diego and Coronado, California; EOD MCM mobile unit detachments are also based at Charleston, South Carolina, and Whidbey Island, Washington. In October 2006, the Navy disestablished the Commander, Mine Warfare Command, in Corpus Christi, Texas, and began moving staff to the revamped Naval Mine and Anti-Submarine Warfare Command in San Diego. All air, surface, and underwater MCM and explosive-ordnance-demolition assets will be operating out of southern Texas in the next few years. That needs to be borne in mind, because although the airborne MCM helicopter squadrons, EOD MCM mobile units, and NSCT 1 can be airlifted anywhere in the world within seventy-two hours or so, assuming overtaxed American strategic airlift assets are available, and while the helos can self-deploy within the United States, the surface vessels have top speeds of only ten or twelve knots, making a quick response in most scenarios problematic.

Under the still-operationalizing “National Fleet” policy, both the Navy and Coast Guard are looking to innovative solutions to meet current and future requirements across the spectrum of both services’ roles, missions, and tasks. (First promulgated by Commandant Admiral James M. Loy and Chief of Naval Operations Admiral Jay Johnson in September 1998, the National Fleet policy has since been formally expanded and embraced by subsequent commandants and CNOs, in 2002 and 2006.)<sup>30</sup> For example, the Navy is addressing domestic MCM requirements and capabilities, and Navy and Coast Guard planners are developing a joint domestic MCM concept of operations within the MOTR planning process. But perceptions of the threat and requirements to deal with it are uneven: in mid-2007, for example, the Department of Defense concept of operations for maritime domain awareness did not even mention mines, much less UWIEDs, and there were no formal operational DoD requirements for domestic mine countermeasures operations.

One of the Coast Guard’s contributions to the National Fleet will be a new Deployable Operations Group (DOG), championed by Admiral Allen. The concept calls for a close integration of the Coast Guard’s port security units, the

National Strike Force, maritime safety and security teams, the Maritime Security Response Team, and the tactical law enforcement teams into adaptable force packages that can be surged domestically and internationally to meet emergency requirements.<sup>31</sup>

Moreover, these forces will be available not only to Coast Guard operational commanders but also to other federal agency operational commanders for missions throughout the United States and overseas high-interest areas. If the new DOG can be taught some old (and new) MCM tricks, even if no more than mine-awareness training, the group's adaptable force packages could be the Coast Guard's "surge responders"—complementing the first-responder sector and COTP personnel already on scene—to an M/UWIED incident well in advance of Navy mine countermeasures forces that might require several days if not longer to respond, unless the threat presents itself in or near Charleston, Norfolk, San Diego, or Whidbey Island.

"But, I'm not sure we've done all our homework concerning who could or should hunt for real weapons," says Captain Thomas B. Davilli, USN (Retired), who has extensive air MCM operational and command experience.<sup>32</sup> "One thing I do know, AMCM, SMCM, and UCMCM [airborne, surface, and underwater MCM] assets are designed and prepared for and take specific procedural measures to allow them to operate safely in the presence of the threat. Whether others will have the capability is doubtful," he continues. "Some players in a recent war game pointed to a local law enforcement organization that has an EOD-like response dive team. It might be able to handle an underwater IED, but they are not diving in low-influence gear. And, the presence of an antitamper countermeasures device on the mine or UWIED certainly complicates consideration of manned operations." Further, "Others have suggested hunting for actual mines from small craft towing commercial side-scan sonars. The helmsman and other crew would indeed be patriots! The thought of sending crewed assets into a mined threat area without signature silencing or some sort of 'safe track' procedures is foolish."

In July 2007, the Coast Guard announced that it had been training as many as six hundred police and rescue scuba-team divers to help protect the nation's ports, harbors, and waterways against terrorists.<sup>33</sup> "For the first time in the industry, we have a malicious threat to manage," Steven Orusa of the International Association of Dive Rescue Specialists has noted. "Any place that has water in its jurisdiction may have a risk—recreational, commercial, shipping or industrial." Some teams have received new equipment, such as underwater robots and sonar systems. In Jacksonville, Florida, the sixteen-member dive team responsible for underwater security is part of the sheriff department's homeland security division. In the past two years, the team received \$596,000 from the Department of

Homeland Security to buy equipment, including boats, a sonar system, and an underwater remotely operated vehicle. Kenneth McDaniel, chief of underwater port security for the Coast Guard, comments that his unit has worked with the Department of Homeland Security intelligence division to develop a course that teaches divers how to search for and identify “underwater hazardous devices” or explosives that might have been placed on ship hulls, bridges, or piers. “We do underwater hull searches, and we sweep ports,” Orusa, leader of a dive team that covers Chicago and other Midwest towns, explains. “There’s a whole layer of skill sets we’ve developed.”

There are concerns, however, should anything but the simplest limpets or UWIEDs be encountered. Underscoring the importance of appropriate equipment, preparation, and training, Captain Davilli concludes, “clearly, this is not a job for well-intentioned amateurs.”

#### THE M/UWIED DEFENSE CHALLENGE

The United States confronts the daunting task of protecting, as noted, some ninety-five thousand miles of coastlines, as well as thousands of miles of inland and Great Lakes waterways, 361 ports, and a territorial sea/exclusive economic zone that comprises more than 3.4 million square miles of ocean space and at any time is cluttered with thousands of warships, commercial vessels and fishing boats, tugs and ferries—not to ignore millions of private pleasure craft. Sorting the legal from the illegal in such a complex maritime domain is a Herculean task that challenges federal, regional, state, and local agencies, as well as commercial entities and other nongovernmental organizations, to work hand in glove and also to collaborate with allies and friends to safeguard maritime security at home and abroad.

Maritime domain awareness—what the 2005 *National Strategy for Maritime Security* describes as the “effective understanding of anything associated with the maritime domain that could impact the security, safety, economy, or environment of the United States, and identifying threats as early and as distant from our shores as possible”—will thus be absolutely necessary for success against a broad spectrum of maritime threats, including mines and underwater IEDs.<sup>34</sup>

Exacerbating the M/UWIED challenge for federal, state, and local actors is the fact that no two ports are alike. Each differs in geography, channel layout, bathymetry, wind, tide, current, bottom sediment, turbidity, climate, and critical infrastructure—piers and wharves, moorings, navigation markers, cables, pipelines, and more, with most bottom infrastructure uncharted or its location long forgotten. That fact will make the already complex problem of detecting, identifying, and defeating M/UWIEDs even more daunting. Questions begging answers include:

- What is already on the bottom?
- How do we know when something new is there?
- What is the local oceanographic and environmental situation?
- What port or waterway infrastructure needs to be protected from M/UWIEDs, as well as from the Navy's countermine operations?
- In a crisis, could we quickly and effectively tell the difference between a refrigerator or a fifty-five-gallon drum—what in the MCM trade is called a “nonmine/minelike bottom object” (or “NOMBO”)—and the real thing?

The best MCM is to interdict the minelayers before the weapons can be put in the water. If that fails, the Coast Guard, Navy, FBI, Bureau of Alcohol, Tobacco, Firearms and Explosives, and other federal and nonfederal first responders will need to understand what the Naval Oceanography Program describes as the “intelligence preparation of the environment.”<sup>35</sup>

First, strategic, operational, and tactical intelligence about the mine/UWIED threat is absolutely essential: What terrorist groups are active? What weapons might they have? Are there any indications and warning that they are planning single or multiple strikes in U.S. waters? What tactics might they employ? In addition to good strategic and operational intelligence, existing and future MDA vessel surveillance, identification, and tracking systems and organizations, such as the Coast Guard/Navy Joint Harbor Operations Centers, need to be “attuned” at the tactical level to the potential need to detect, control, and engage minelayers before they start their tasks.

Second, and of equal but different importance, there must be environmental awareness of potential mining areas and data of sufficient quality and currency to support MCM operations. At least for each of the seventeen tier-one ports these data must be available and up to date:

- Port geography and infrastructure from the high-water mark seaward
- Climatic, environmental, and oceanographic factors and their daily/monthly/yearly variations
- Detailed sonar bottom maps and surveys, at high precision and accuracy, to determine clutter and known NOMBO contacts for change detection and possible channel conditioning *before* a crisis erupts.

It has been years since the U.S. Navy, developing port-breakout concepts in the Cold War, conducted routine bottom surveys and mapped “Q-routes” to ensure the safe egress of warships and auxiliary and sealift vessels in support of national strategies and war plans. While there might well be databases for selected ports, waterways, or estuaries that could satisfy some (but certainly not all) port

geography and environmental data needs, the reality, as former defense secretary Donald H. Rumsfeld acknowledged, is that “we don’t know what we don’t know.”

Who has what data and information today? The Oceanographer and Navigator of the Navy? The Meteorology and Oceanography Command? The Coast Guard? National Oceanic and Atmospheric Administration (NOAA)? The Corps of Engineers? State or local agencies, or regional authorities? Local pilots and the maritime transportation industry? Sea Grant colleges and marine environmental groups? Whoever has these data, are they good enough to support MCM operations? Where are the gaps in our knowledge? Who should have the responsibility to fill them?

Some have suggested that the Navy revisit its port-breakout model for key commercial and military ports to identify critical routes and other areas needing attention and to conduct channel-conditioning operations that would in essence wipe clean selected areas to facilitate subsequent change detection. (By 2006, the Royal Navy had already embarked on such an effort in several British ports.) Others have proposed resurrecting the ill-fated COOP—Craft of Opportunity—program of the mid-1990s and having Navy Reserve units conduct periodic surveying and sonar mapping of bottoms. Still others have recommended that the maritime transportation industry and port authorities take the lead for local areas. Or the survey and mapping responsibilities could be outsourced to commercial contractors. In short, in mid-2007 there was no coherent plan, staffing, or program—except perhaps for references to the USCG’s sector/COTP responsibilities for port maritime security plans, area security assessments, and area maritime transportation plans, in addition to the efforts of the Maritime Security Policy Coordination Committee—to address this threat and port geography and environmental data requirements. Even then, Captain Davilli’s concerns loom large.

Collecting such MCM data for even a handful of ports and keeping it up to date will not be inexpensive. In May 2007, for example, NOAA estimated that it could conduct a survey program that would support draft Navy–Coast Guard operational concepts—twenty ports per year and relooking every three years—at a cost of approximately \$14 million per year. This figure is well below an “educated guess” that Los Angeles/Long Beach alone would require about \$10 million annually, raised during a December 2006 technology war game.<sup>36</sup> In any case, compared to the \$60 billion economic impact if major ports were closed for a couple of weeks or more, several million dollars each year seems to be an insurance premium that the nation could and should afford.

Still, the operational challenge should not be underestimated. An April–May 2007 San Diego mine warfare harbor survey conducted by Third Fleet and supported by the Naval Oceanography Operations Command, the Naval

Oceanographic Office, EOD Group 1, U.S. Coast Guard Sector San Diego, and NOAA provided a real-world look at the complexity of the problem. According to Captain James Berdeguez, Director, Oceanography Operations for Mine Warfare at the Naval Oceanography Operations Command, the survey of eleven nautical miles of channel and secondary areas required nearly six hundred man-hours to complete—350 hours for the actual survey and about 230 hours for analysis of the data collected on the more than six hundred minelike and nonminelike contacts detected.<sup>37</sup> Clutter, bottom roughness, sediment burial, in situ optics, currents, bathymetry, sound-velocity profiles, and infrastructure significantly complicated the survey effort.

However any focused domestic mine survey program is undertaken, a consensus is growing that there must be a central database of American port infrastructure and environmental survey data that can “set data standards, conduct critical analysis to produce tactical decision aid products, and hold this information centrally,” according to Commander Robert Witzleb, Deputy Director, Oceanography Operations for Mine Warfare.<sup>38</sup> “Such a centralized data repository exists in practice at the Naval Oceanographic Office, which has the largest oceanographic holdings in the world, but is nonetheless very weak in US waters. For that reason,” he continued, “Navy METOC [the Meteorology and Oceanography Command] has prepared a draft technical instruction, Mine Warfare Survey in Support of Maritime Homeland Defense, that explicitly details how we would collect environmental data to support domestic MCM operations.”

“We need that information now, not when the act takes place,” Tony Fuller, who supports concept development and experimentation for Navy mine warfare sea trial initiatives, noted in a March 2007 e-mail exchange. “There is a significant amount of gap analysis that will need to be conducted, probably followed by substantial programmatic issue work. In simplest deck-plate terms, the direction as to what has to be brought to bear in a port to begin MCM in how much time, culminating with what has to be accomplished, in how much time, to make the call that all, or part, of a port is ‘open’ is needed.”

Finally, there are operational and tactical issues that need to be addressed. The Coast Guard and Navy in the spring of 2007 were developing a domestic MCM concept of operations within the MOTR framework. These concepts and associated response plans, which will involve relevant state and local actors, must be specific to and in place for selected ports and waterways well in advance of the first “flaming datum.” The two services are building upon recent war games and exercises—for example, LEAD SHIELD III in 2005, which brought together a broad spectrum of federal, state, and local agencies and organizations to deal with terrorist mines in the port of Los Angeles/Long Beach—and upon the Navy’s real-world experiences of clearing the port of Umm Qasr, Iraq, in 2003.



Coast Guard, Navy, and other participants must equip for, train to, and exercise the plans; analyze and share the results of the exercises and war games; refine concepts of operations and “TTPs” (tactics, techniques, and procedures); incorporate new technologies and systems—and then plan and train and exercise again, and then again.

“The Umm Qasr port MCM ops show what we might confront in a domestic mining incident,” said Captain Terry Miller, who has more than twenty years’ experience as a surface mine warfare officer and commander, including in DESERT STORM mine-clearance operations.<sup>39</sup> An international MCM force comprising Royal Australian Navy and Royal Navy explosive-ordnance-demolition and mine countermeasures specialists and American NSCT 1 divers, aided by marine mammals and UUVs, cleared some nine hundred square miles to enable the landing ship RFA *Galahad* to deliver much-needed humanitarian-relief supplies at the outset of Operation IRAQI FREEDOM.

“The Australians worked in some very confined areas, alongside piers, and among numerous obstacles and clutter,” Miller noted, “and were aided by their extensive HLS planning and training for the 2000 Sydney Olympics.” The lack of prior knowledge of the port and its approaches, however, contributed to the fact that nine days of intensive underwater MCM operations were needed to clear the channel for *Galahad* and follow-on shipping. Closing Los Angeles/Long Beach for nine days could cost the American economy as much as \$18 billion.

These domestic plans and concepts of operations should also identify where the Navy can sweep and where it must hunt. Constrained airspace and water space and extensive port infrastructures will certainly affect the ability to use traditional airborne and surface sweeping gear or to neutralize mines/UWIEDs by hunting or sweeping. While in some cases it will be appropriate to “blow in place” weapons that are discovered, in others critical port assets could be damaged severely by a detonation. When “BIP” is not feasible, the Navy would have to raise and neutralize or render safe the mines, a process that would also support intelligence exploitation of the weapons and law-enforcement evidentiary needs. It would also, however, increase the danger and the duration of the counter-mine process.

There are, as well, logistical concerns that arise unless the mine crisis occurs near Navy MCM bases or home ports. Transit times will affect responses and contribute to economic hardships until ports and waterways are declared safe. If mine countermeasures helicopters had to self-deploy across the country, they might require maintenance before getting gear in the water, unavoidably extending the duration of the crisis. The physical security of MCM assets—helicopters at nearby commercial airports and vessels in commercial berths—must also be assured, which could put additional strains on local capabilities. Finally, the plans must

consider “hotel” sustainment for crews—including the marine mammals, if they deploy—and support people and maintenance support for platforms and systems if the crisis goes on for long. In short, the Coast Guard and the Navy must start planning notional “time-phased force deployment data” for domestic MCM operations.

“Until we have an approved HLS/MCM CONOPS [concept of operations] it’s hard to say what level of capability is missing,” Captain Miller offered. “Most certainly confined waters inside an inner harbor pose challenges for the current force construct, although we did adapt and overcome the Umm Qasr challenge with some innovations in systems and TTPs. Plus we have quite extensive lessons learned from ‘Down Under’ during the Sydney Olympics,” he continued. “Sydney had an extensive harbor defense plan that accounted for mines and floating IEDs and is a blueprint for any mine/UWIED scenario and domestic MCM planning.”

In the spring of 2007, Rear Admiral John J. Waickwicz, Commander, Naval Mine and Anti-Submarine Warfare Command, directed his staff to brief him on the operational environment and all salient issues and requirements relating to the Navy’s support to Northern Command, the Department of Homeland Security, and the Coast Guard in response to a mining or IED attack in U.S. ports or waterways.<sup>40</sup> A predecisional brief underscored the impression that the Navy’s mine warfare community is taking this threat seriously. Indeed, for the last several years—via conferences, full-scale exercises, and national-level command-post exercises—the mine force has been working to define operational response requirements sufficiently to allow concepts of operations and port-specific response plans to be developed and put in place. Meanwhile, “joint” Navy and Coast Guard planning continues within the MOTR framework.

It continues in other venues as well. For one, “Charleston has created Project Seahawk to address and implement port-security capabilities against terrorism,” Rear Admiral Charles “Chuck” Horne, USN (Retired), has noted.<sup>41</sup> Horne, who served as Commander, Mine Warfare Command in Charleston and still resides there, is helping the SEAHAWK Team to include the terrorist mine threat. “Project SEAHAWK will be looking at ways to prevent as well as respond to a mine threat by addressing it well ahead of time.”

“The harbor and port MCM problem will not ultimately be resolved using traditional AMCM, SMCM, UMCM assets,” Rear Admiral Deborah A. Loewer, USN (Retired), cautions, “as these tactics won’t work in the confined waters of ports, harbors, and approaches.”<sup>42</sup> Loewer, who was the last commander of Mine Warfare Command before its stand-down on 1 October 2006, explained, “This problem will be solved using a combination of small vessels and helos, towed sensors, UUVs, EOD, change detection and a variation of the tools currently under development for the MCM mission package for the Littoral Combat Ship.”

“Admiral Loewer’s comments are right on the mark,” Rear Admiral Richard D. Williams III, USN (Retired), underscores.<sup>43</sup> “The breadth and complexity added to the mine problem in an in-port/near-port home-waters situation, as compared to the blue-water or assault-breaching situation, are significant. Not only are U.S. Navy ship and aircraft MCM assets of limited utility in in-port/near-port roles, but operationally useful environmental, bottom, and port infrastructure data and prearranged logistical and support procedures for each individual port of major importance will be critical to a timely, successful, and safe response to an in-port mine/UWIED scenario.” Admiral Williams notes further, “The most important issue [for] current efforts—as well as supporting efforts at all levels and across all boundaries that need to proceed with appropriate priority—is to define action responsibilities so that requirements can be clearly determined and articulated and budgets aligned to ensure that the right tools and operational support are acquired and put in place *before* they are needed.”

In short, once formal requirements for domestic MCM operations are established, operational concepts and concepts of operations agreed upon, risk assessments conducted, and priorities among and timelines for the various ports articulated, capabilities strengths and gaps identified, and time-phased force deployment data laid out, government and industry programs can be put in place to ensure that strategic, operational, and tactical objectives will be met.

“Such a capability would have a deterrent effect,” Vice Admiral Hull has underscored, “and could make our adversaries think twice before attempting to mine U.S. waters. Why make the attempt if it will be for naught?”

#### A TERRIBLE THING THAT WAITS . . .

The “anonymous, loosely affiliated perpetrators” who would strike America’s ports and waterways have no qualms about “unchivalrous” attacks against any target that would serve their causes. As Rear Admiral Farragut understood, “it does not do to give your enemy such a decided superiority over you.”<sup>44</sup>

In 1950, after three thousand mines stymied plans for an amphibious assault on Wonsan, the Chief of Naval Operations, Admiral Forrest Sherman, declared, “We’ve been plenty submarine-conscious and air-conscious. Now we’re going to start getting mine-conscious—beginning last week!”<sup>45</sup> Four decades later the CNO, Admiral Frank Kelso, underscored fundamental lessons relearned in the northern Persian Gulf and called for renewed mine consciousness: “I believe there are some fundamentals about mine warfare that we should not forget. Once mines are laid, they are quite difficult to get rid of. That is not likely to change. It is probably going to get worse, because mines are going to become more sophisticated.”<sup>46</sup> Writing on the eve of Operation IRAQI FREEDOM, Admiral Robert J. Natter, Commander, U.S. Atlantic Fleet and Fleet Forces Command,

warned: “Our first priority must be improving our near-term capabilities, but it is also important to keep an eye on our long-term vision of mine warfare. . . . Given the growing threat to our fleet and the current state of technology, we are fools if we don’t.”<sup>47</sup>

Eight thousand foreign-flag ships enter American ports each year. Millions of other vessels and pleasure boats ply America’s waterways. But only a few come under close scrutiny by the Coast Guard or the Navy or state and local marine police. This is troubling, as the Libyan ferry *Ghat* proved beyond reasonable doubt that any ship can be a mine-layer once—if not many times. In short, as we address America’s “threat-rich” maritime security problems we must become mine and UWIED conscious, if not “last week” then certainly *before* a terrorist’s weapon ruins our day.

#### NOTES

1. Earlier drafts of this article were the baselines for presentations at the December 2006 meeting of the Heritage Foundation Maritime Security Group; the January 2007 Maritime Security Awareness Seminar, sponsored by the Defense Threat Reduction Agency and the U.S. Merchant Marine Academy; the March 2007 NDIA Joint Undersea Warfare Technology Conference; and the May 2007 Mine Warfare Association Panama City Conference. The author thanks several people who helped him think through this topic: George Croy, Tom Davilli, Tony Fuller, Chuck Horne, Bill Key, Deb Loewer, Kenney McDaniel, Terry Miller, Bob O’Donnell, George Parisi, John Pearson, George Pollitt, Scott Price, Paul Ryan, Scott Savitz, Tim Schnoor, Ed Whitman, Ray Widmayer, Rick Williams, and Robert Witzleb.
2. U.S. Homeland Security Dept., *The U.S. Coast Guard Strategy for Maritime Safety, Security, and Stewardship* (Washington, D.C.: U.S. Coast Guard, 2007), p. i.
3. IEDs have been one of the most treacherous and deadly means of insurgent attacks in Iraq, for example, accounting for about 40 percent of all casualties through mid-2007. During a meeting on 1 June 2007, Under Secretary of Homeland Security for Science and Technology Jay M. Cohen listed the “domestic IED” along with communications interoperability as his two highest priorities.
4. Tamara Moser Melia, “*Damn the Torpedoes*”: *A Short History of U.S. Naval Mine Countermeasures, 1777–1991* (Washington, D.C.: Naval Historical Center, 1991), p. 144; and Gregory K. Hartmann and Scott C. Truver, *Weapons That Wait: Mine Warfare in the U.S. Navy*, updated ed. (Annapolis, Md.: Naval Institute Press, 1991), p. 36.
5. See, for example, *Maritime Operational Threat Response for the National Strategy for Maritime Security* (Washington, D.C.: Maritime Security Policy Coordination Committee, June 2006), pp. 5–11.
6. Moser Melia, “*Damn the Torpedoes*,” p. 7; and Hartmann and Truver, *Weapons That Wait*, pp. 17–18.
7. In the summer of 1777, Bushnell rigged a double line of “torpedoes” to attack the

- British warship *Cerberus*. The British prize crew of a captured American schooner saw the mines and attempted to haul them on board, which caused them to fire, killing most of the crew and sinking the schooner, while *Cerberus* was unharmed. Mine warfare pundits point to this incident as the origin of the phrase “Any ship can be a minesweeper, once.”
8. For the Boston incident, “Two Held after Ad Campaign Triggers Boston Bomb Scare,” CNN.com, 1 February 2007. Turner Broadcasting System Inc. and its advertiser, Interference Inc., paid Boston two million dollars in restitution and other compensation for the “hoax,” which shut down key roads and the Charles River; “On Deadline,” *USA Today*, available at [blogs.usatoday.com/ondeadline/2007/02/turner\\_guerrill.html](http://blogs.usatoday.com/ondeadline/2007/02/turner_guerrill.html).
  9. Stephen S. Cohen, “Economic Impact of a West Coast Dock Shutdown” (Berkeley Roundtable on the International Economy, University of California at Berkeley, January 2002), pp. 11–12; and Jon D. Haveman and David Hummels, *California’s Global Gateways: Trends and Issues* (San Francisco: Public Policy Institute of California, 2004), pp. 59–62.
  10. Numerous publications and reports are useful for understanding the mining and mine countermeasures “problem” and the history of mine warfare, including U.S. Navy Dept., *Mine Warfare Plan: Meeting the Challenges of an Uncertain World* (Washington, D.C.: Office of the Chief of Naval Operations [hereafter CNO], 29 January 1992), and subsequent mine warfare plans published by the Navy Staff’s director, Expeditionary Warfare in 1994, 1996, and 2000; Edward J. Marolda, ed., *Operation End Sweep: A History of Minesweeping Operations in North Vietnam* (Washington, D.C.: Naval Historical Center, 1993); H. Dwight Lyons, Jr., et al., *The Mine Threat: Show Stoppers or Speed Bumps* (Alexandria, Va.: Center for Naval Analyses, July 1993); National Research Council, *Oceanography and Mine Warfare* (Washington, D.C.: National Academy Press for the Ocean Studies Board, 2000); and National Research Council, *Naval Mine Warfare: Operational and Technical Challenges for Naval Forces* (Washington, D.C.: Naval Studies Board, 2001). Greta E. Marlatt of the Dudley Knox Library, Naval Postgraduate School, Monterey, California, has published a very useful and comprehensive “Sea Mines and Countermeasures: A Bibliography,” available at [library.nps.navy.mil/home/bibs/seamines](http://library.nps.navy.mil/home/bibs/seamines).
  11. Director, Expeditionary Warfare (N85), “FY07 U.S. Naval Mine Countermeasures (MCM) Plan: Vision, Roadmap, and Programs,” unclassified briefing, 14 March 2006; and Rear Adm. John Christenson, Vice Commander, Naval Mine & Anti-Submarine Warfare Command [hereafter NMAWC], Commander, Task Force 21, MIW briefing to the Surface Navy Association, 9 January 2007. For a broad overview of the M/UWIED threats and the capabilities to deal with them, see the briefings presented at the Mine Warfare Association Spring 2007 Regional Conference, Panama City, Florida, archived at [www.minwara.org/Meetings/2007\\_05/Spring\\_2007\\_Agenda.htm](http://www.minwara.org/Meetings/2007_05/Spring_2007_Agenda.htm), especially Vice Adm. Terry Etnyre, USN, Commander, Naval Surface Forces, “MCM Forces Readiness,” 10 May 2007; Rear Adm. J. J. Waickwicz, USN, Commander, NMAWC, “Mine Warfare Strategic Q-Route,” 8 May 2007; Maj. Gen. Thomas Benes, USMC, Director, Expeditionary Warfare Division (N85), “U.S. Navy Mine Countermeasures Capabilities,” 8 May 2007; Rear Adm. John Christenson, USN, Commander, NMAWC Corpus Christi, “New Directions for Mine Warfare,” 8 May 2007; James Thomsen, Program Executive Officer, Littoral and Mine Warfare (PEO LMW), untitled briefing on the PEO LMW “portfolio,” 8 May 2007; Capt. James Berdeguez, USN, Director, Oceanography Operations for Mine Warfare, Naval Oceanography Operations Command, “New METOC Challenges in the Future Mine Warfare Environment,” 9 May 2007; and William Klein, L3 Communications, “Mine and Underwater IED (UIED) Threat to Piers, Berths, and Approaches,” 9 May 2007.
  12. Adm. C. A. H. Trost, CNO (remarks at Mine Warfare Command change of command, 8 July 1989, mimeo), p. 8.
  13. See generally Moser Melia, “*Damn the Torpedoes*”; Hartmann and Truver, *Weapons That Wait*; *Mine Warfare Plan*; Rear Adm. Paul J. Ryan, USN, and Scott C. Truver, “U.S. Navy Mine Warfare Vision . . . Programs . . . Operations: Key to Sea Power in the 21st Century,” *Naval Forces* 24, no. 3 (2003), pp. 28–32; Rear Adm. Paul J. Ryan, USN, “Mine

- Countermeasures a Success," U.S. Naval Institute *Proceedings* (May 2003), p. 52ff.; Vivienne Heines, "Unseen Threats: Navy Attacks Mine-Clearing Issue," *Armed Forces Journal* (December 2003), p. 14ff.; Gregory J. Cornish, *U.S. Naval Mine Warfare Strategy: Analysis of the Way Ahead* (Carlisle Barracks, Pa.: U.S. Army War College, 2003), available at [handle.dtic.mil/100.2/ADA414973](http://handle.dtic.mil/100.2/ADA414973); Robert Houlihan, "Operation Iraqi Freedom, Clearing the Way," *Surface Warfare* (Summer 2003), p. 9; and Adm. Robert J. Natter, USN, "Access Is Not Assured," U.S. Naval Institute *Proceedings* (January 2003), pp. 39–41.
14. Moser Melia, "Damn the Torpedoes," pp. 92–97.
  15. Bradley Peniston, *No Higher Honor: Saving the USS Samuel B. Roberts in the Persian Gulf* (Annapolis, Md.: Naval Institute Press, 2006).
  16. See Scott C. Truver, "The Mines of August: An International 'WhoDunIt,'" U.S. Naval Institute *Proceedings* (May 1985), pp. 94–117; and David W. Cockfield, *The Gulf of Suez Mining Crisis: Terrorism at Sea* (Annapolis, Md.: Naval Institute Press, 1986).
  17. Trost, remarks, p. 4.
  18. "Patrols Stepped Up after Bomb Found on Lake," Channel 6 WDSU.com, 21–22 April 2004; "Explosive Device Found Floating in Lake Pontchartrain," WWLTV.com, 21 April 2004.
  19. Under the Maritime Transportation Security Act, 2002, the Coast Guard is the lead federal agency for maritime security in U.S. waters. See Vice Adm. James Hull, USCG, and Scott C. Truver, "In America's Ports and Waterways, the Coast Guard Is in Charge," in "Maritime Security Source Book," 3rd ed., special supplement, *Maritime Reporter & Engineering News* (August 2004), pp. 18–20, 28–29, available at [www.fleetsecurity.com](http://www.fleetsecurity.com).
  20. *Homeland Defense*, Joint Publication 3-27 (Washington, D.C.: Joint Chiefs of Staff, 12 July 2007), esp. pp. V-5 through V-9.
  21. Interviews and e-mail exchanges, January–March 2007.
  22. *Strategy for Maritime Safety, Security, and Stewardship*.
  23. Scott Savitz and Marian Greenspan, *Lead Shield III and Mine Warfare Homeland Defense: Observations, Analyses, and Recommendations*, CRM D0013240.2/Final (Alexandria, Va.: Center for Naval Analyses, December 2005).
  24. Rear Adm. Richard D. Williams III, USN (Ret.), and Capt. Thomas B. Davilli, USN (Ret.), interviews and e-mail exchanges, January–May 2007.
  25. Donald H. Rumsfeld, Secretary of Defense, and Thomas Ridge, Secretary of Homeland Security, "Memorandum of Agreement between the Department of Defense and the Department of Homeland Security for the Inclusion of the U.S. Coast Guard in Support of Maritime Homeland Defense," 2005.
  26. Donald H. Rumsfeld, Secretary of Defense, and Michael Chertoff, Secretary of Homeland Security, "Memorandum of Agreement between the Department of Defense and the Department of Homeland Security for Department of Defense Support to the United States Coast Guard for Maritime Homeland Security," 2006.
  27. The *Posse Comitatus* Act is a federal law (18 USC § 1385) passed in 1878 after the end of Reconstruction following the U.S. Civil War. The act was intended to prohibit federal troops from supervising elections in former Confederate states. It generally prohibits federal military personnel and units of the U.S. National Guard under federal authority from acting in a law-enforcement capacity within the United States, except where expressly authorized by the Constitution or Congress. The *Posse Comitatus* Act and the related Insurrection Act thus substantially limit the powers of the federal government to use the military for law enforcement. The original act referred only to the U.S. Army. The Air Force was added in 1956, and the Navy and the Marine Corps have been included by a regulation of the Department of Defense. The U.S. Coast Guard—first an arm of the U.S. Treasury Department as the Revenue Service starting in 1790, in 1967 transferred to the then-new Department of Transportation, and since 2003 operating within the Department of Homeland Security—has not been included.
  28. As stated in the Maritime Transportation Security Act of 2002 and the 2005 *National Strategy for Maritime Security*, the Coast Guard will act as the executive agent for DHS and assume primary responsibility for coordinating measures to mitigate the impacts of



a significant incident in the maritime domain. The Coast Guard is also required to engage internationally, on its own authorities, to improve the security of the global transportation system through international compliance with the United Nations' International Ship and Port Facility Security Code. This has placed the Coast Guard in the unique position to identify gaps and strengthen maritime regimes, awareness, and operational capability requirements to ensure efficient and effective maritime security.

29. U.S. Navy "type commanders" equip, train, and maintain forces for employment by operational commanders.
30. Adm. Thad W. Allen and Adm. Michael G. Mullen, "America's 'National Fleet': A Coast Guard-Navy Imperative," U.S. Naval Institute *Proceedings* (August 2006). See also Colin S. Gray, "The Coast Guard and Navy: It's Time for a 'National Fleet,'" *Naval War College Review* 54, no. 3 (Summer 2001), pp. 112–38.
31. Rear Adm. Thomas F. Atkin, USCG, and Scott C. Truver, "A New DOG in the Hunt," U.S. Naval Institute *Proceedings* (August 2007), pp. 22–24. During meetings with Rear Adm. Atkin for this DOG article in May–June 2007, he discussed the M/UWIED challenge and how the DOG might be a key complement to the Coast Guard's first-response teams in the sector organizations.
32. Interviews and e-mail exchanges, January–May 2007.
33. Mimi Hall, "Uncle Sam to Scuba Divers: I Want You," *USA Today*, 9 July 2007.
34. *National Strategy for Maritime Security*, p. 27. See also the Coast Guard's *Strategy for Maritime Safety, Security, and Stewardship*, pp. 40–43, for a discussion of MDA needs and priorities; and *Homeland Defense*, Joint Publication 3–27, pp. V-8 through V-9, for the DHS role and reasons to conduct MCM operations in waters under U.S. jurisdiction.
35. Berdeguez, "New METOC Challenges in the Future Mine Warfare Environment"; and Klein, "Mine and Underwater IED (UIED) Threat to Piers, Berths, and Approaches."
36. E-mail interview with then-Lt. Cdr. Robert Witzleb, Deputy Director, Oceanography Operations for Mine Warfare, Naval Oceanography Operations Command, 10 May 2007.
37. Berdeguez, "New METOC Challenges in the Future Mine Warfare Environment"; and Klein, "Mine and Underwater IED (UIED) Threat to Piers, Berths, and Approaches."
38. Interviews and e-mail exchanges, January–July 2007.
39. Interviews and e-mail exchanges, February–March 2007.
40. Waickwicz, "Mine Warfare Strategic Q-Route."
41. E-mail exchange, 11 July 2007.
42. Interviews and e-mail exchanges, December 2006 and January 2007.
43. E-mail exchange, 10 July 2007. Adm. Williams was the first Program Executive Officer, Mine and Undersea Warfare, and at the time of this writing held the chair of Expeditionary and Mine Warfare, Naval Postgraduate School.
44. Letter to Secretary of the Navy Gideon Wells, 25 March 1864, in Moser Melia, "Damn the Torpedoes," p. 9.
45. Moser Melia, "Damn the Torpedoes," p. 79.
46. U.S. Navy Dept., *U.S. Navy Mine Warfare Plan*, 2nd ed., Fiscal Year 1994–1995 Programs (Washington, D.C.: Expeditionary Warfare Division, 1994), p. 3.
47. Natter, "Access Is Not Assured."